POINTS ABOUT DRAWING INSTRUMENTS

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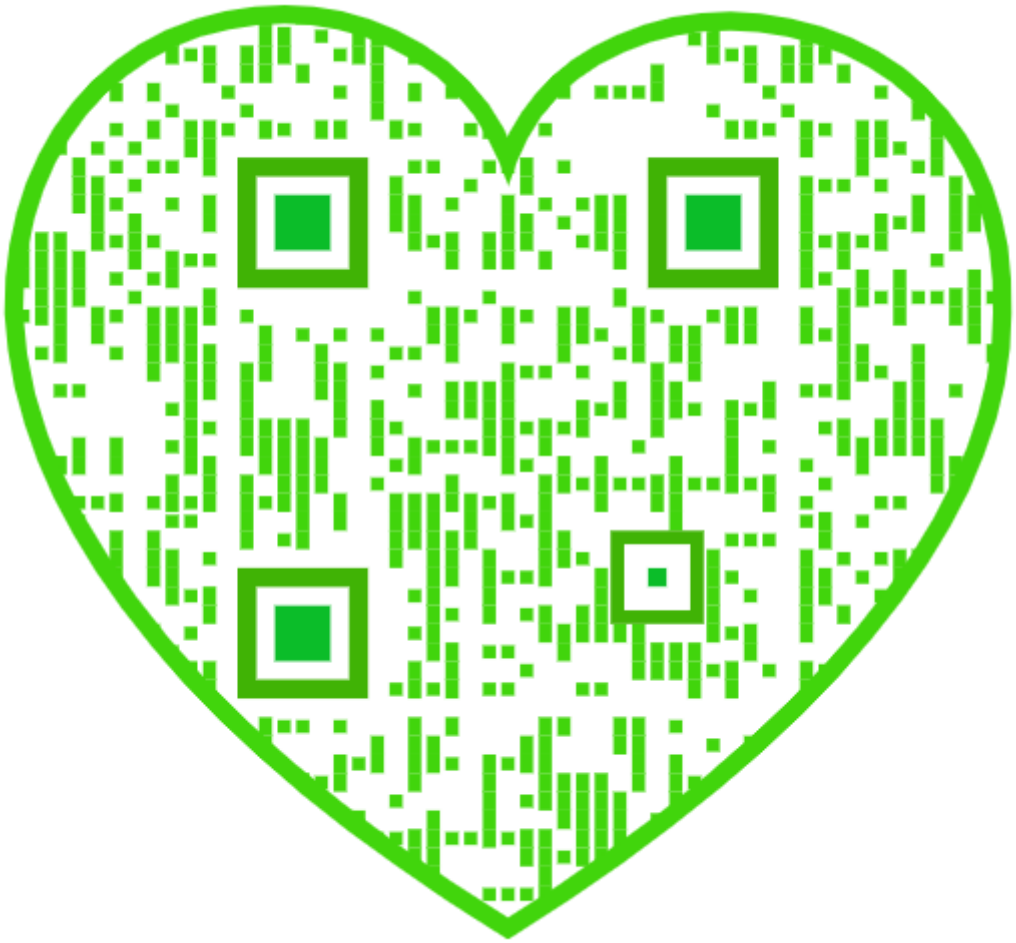

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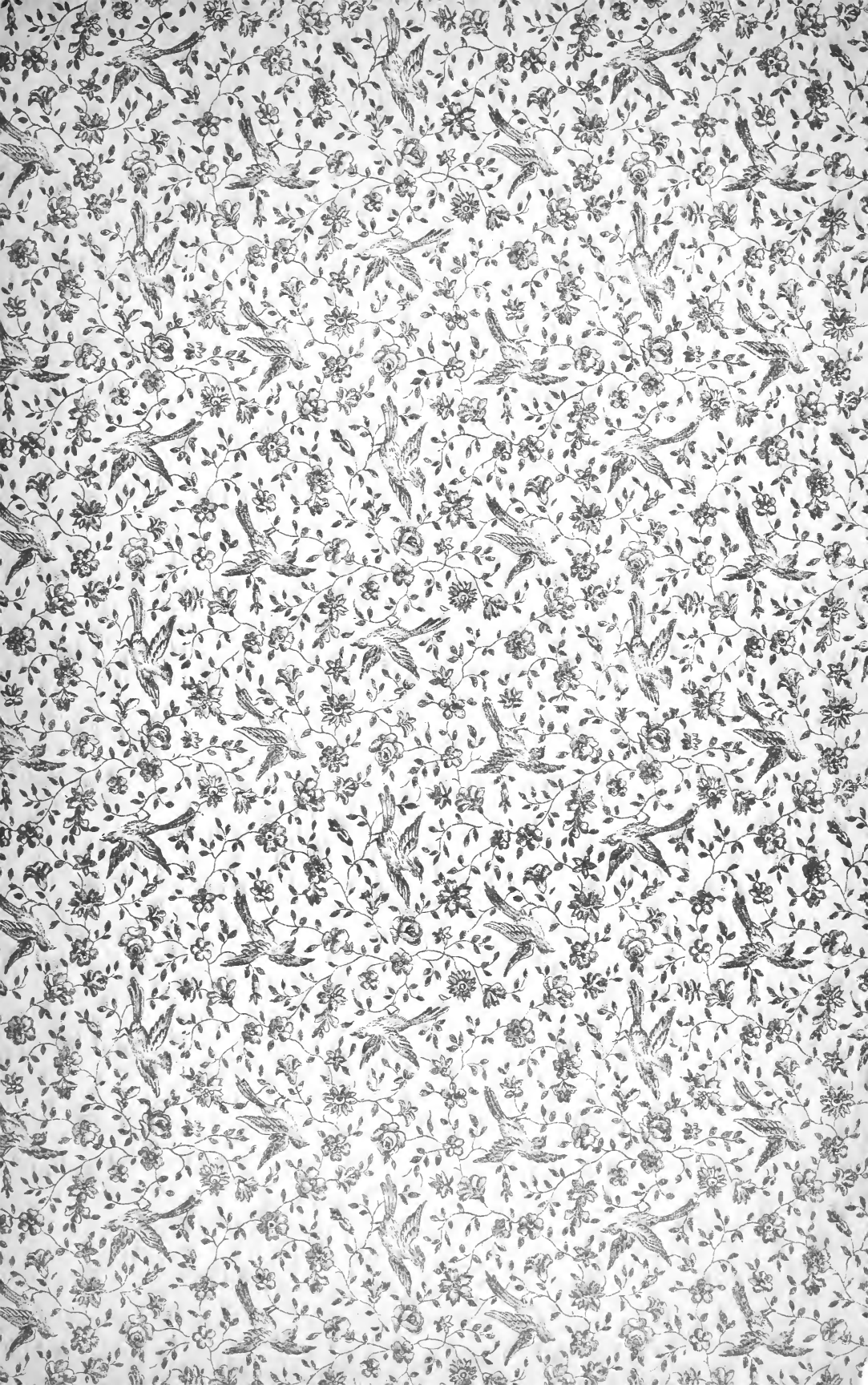

Points About Drawing Instruments.

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By Theodore Alteneder.

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Alteneder's Drawing Instruments.

THE accuracy, elegance, speed and even success of the draughting done by the professional man, is in a measure dependent upon the qualities of the instruments which he uses. The nearer they are to perfection in every minute detail as to form, construction, proportion, material and finish, the nearer can he approach to perfection in his work. With perfect tools, there is nothing to prevent his acquiring the manual dexterity necessary to produce the best work in the least time, and, as these tools are constantly used by him during the active period of his career, their first cost is of small importance in comparison with their qualities. He may use one instrument throughout a period of thirty years or more, when the weight, feel and location of the parts become so familiar that the operations are performed instinctively, and the mind is left entirely free for its legitimate work, and is not hampered by any demands on it in connection with the merely mechanical part of the draughting. But such an instrument must be perfect originally and must be so well constructed and all its parts so well fitted that they will retain their qualities. For such an instrument he can afford to pay any price ; that is to say, it would be true economy for him to pay the cost of such qualities if he felt convinced that he was obtaining them.

Thoroughly believing in these truths, we have faithfully and persistently endeavored to attain perfection in material, form, fit and finish, and we now submit genuine Alteneder Instruments as the results of over forty years of such efforts, with the full conviction that for convenience of handling, for rapidity and delicacy of adjustment, for retention of position, for all desirable stiffness (*combined with remarkable lightness*), for the fineness and accuracy of the work that can be done with them, and for their reliabilty as to RETAINING

THEIR QUALITIES during years of constant use, THEY ARE SUPERIOR TO ANY INSTRUMENTS OF THE KIND.

Every piece that we offer for sale is manufactured in our own shops, under our personal supervision, and is guaranteed to be as represented.

IMITATIONS.

MANY imitations of our instruments have been manufactured, particularly in Germany, in which the form and sizes of the parts have been closely followed, but the material and workmanship have been so inferior that in a very short time the instruments have become unfit for skilled hands and impossible of repair, so as to be practically useless. Money spent on such cheap and inferior tools is literally thrown away, and some of our old customers have left with us examples of such, as a warning to purchasers who might doubt the reasonableness of our prices.

These imitations are often catalogued in a manner calculated to mislead the purchaser; some at a lower figure and others at the same prices as genuine Alteneder Instruments, a discount being offered as an inducement. Should the customer be posted and ask for our name or trade-mark, he is reluctantly informed that they are not Alteneder's make, but "just as good." We therefore wish to inform the intending purchaser of the necessity of specifying "*genuine* Alteneder Instruments, manufactured by Theo. Alteneder, Philadelphia." Each genuine instrument bears the name, T. Alteneder or trade-mark "T. A." stamped on it. For such instruments we are responsible, and if any defects arise at any time after the instrument is in use, that can be attributed to a fault in the workmanship or material, we repair or replace free of cost, whether purchased direct of us or through a dealer. We cannot offer any discounts, but we can furnish the BEST instruments at a fair price.

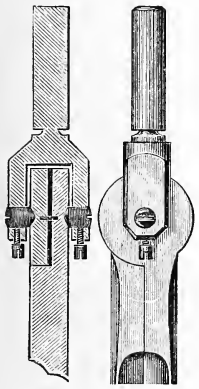
Descriptions and illustrations of the instruments which we manufacture, will be found in the following pages.

Alteneder's Patent Joint Dividers.

MATERIAL.

THE body and legs are made of German silver, coined or swaged in steel dies in order to make the metal compact, homogeneous, hard and elastic. The steel which is used is the very best that can be procured, and is well worked and tempered.

ALTENEDER'S PATENT JOINT.



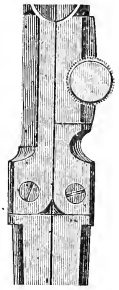
Alteneder's Patent Joint.

THIS joint was invented by Theo. Alteneder, Sr., and patented in 1850 and again in 1871. Experience has proved it to be the only perfect joint for drawing instruments, and, if properly constructed, it can never wear or give out in any way. It is now largely imitated by other manufacturers, but the construction is usually so poor as to make it practically worthless for accurate draughting. As we construct it, it is very accurately fitted with a washer between two flat, circular-bearing sufaces, which are clamped together by means of the conical points of two opposite screws carried in a head of German silver, the metal of which has been hammered to make it stiff and of reliable elasticity. This arrangement is based upon correct theory. It ensures a uniform pressure and amount of friction in all positions of the legs of the instrument, so that when the joint is once adjusted to suit the requirements or fancy of the user, it will have the same stiffness or "feel" in all positions, and will retain it.

In the cheap imitations of this joint, the friction does not depend upon the spring pressure of the head. In consequence of this, the joint soon becomes loose, and any attempt to tighten it will prove

unsuccessful, because the clamping-head is made of a simple casting which possesses no elasticity and will permanently and continually bend under the strain of the screws.

KNUCKLE-JOINTS.



Knuckle-Joints.

EACH leg is provided with a knuckle-joint to enable the needle-point and the pencil or pen to be kept approximately perpendicular to the paper in making circles of any radius within the capacity of the instrument. These joints are carefully fitted and possess the same stiffness in all positions. They are secured by screws, so that this stiffness can be adjusted to suit the fancy of the user. In cheap instruments, these are rivets with imitation screw-heads, it being impossible to cut a thread in the instrument that will hold, on account of the metal being a soft casting, and not hammered ; so that when the joint becomes loose, as it invariably does on account of the bad fitting, there is no way of tightening it, and the tool is useless.

SPRING PEN.

Spring Pen.

THIS improved pen is made of one piece of steel, without any joint between the two blades, thus ensuring that the points will always match, and avoiding any possibility of lost motion. The outside blade is in the form of a spring for the purpose of increasing the ease of adjustment and the distance it can be separated for cleaning. The blades are tempered and ground to the best form for making perfect lines of any desired thickness, and to secure a ready flow of ink. The steel, shape and temper are the results of long experience and are unequaled. The adjusting-screw is of steel and has a washer under the milled head. It is well fitted, but of very easy adjustment. The thread is guaranteed not to strip.

NEEDLE AND PENCIL CLAMP HOLDERS.

Clamp Holders.

THE holders for the needle-point and for the lead are parallel to the central axis, are accurately drilled and are split to an unusual length, so that the clamping-screws will hold the needle-point and the lead firmly and uniformly, thus enabling their positions to be relied on.

This form of clamp holder can be loosened just sufficient to permit the needle-point or lead to be pushed in or out to give an exact adjustment of length and can be tightened without altering this adjustment in the least. This is a great improvement over any of the old methods of holding the needle-point and lead.

ALTENEDER'S IMPROVED CLAMP SOCKETS.

Clamp Sockets.

IN our dividers with interchangeable pen and pencil, the shanks on the latter enter freely a socket in the leg, which is split and is provided with a clamping-screw, by means of which it is pinched solidly upon the shank, thus avoiding all wear, and at the same time enabling the parts to be readily separated. This is a great improvement over the ordinary sockets, which, from wear and imperfect construction become loose, rendering the whole instrument unreliable.

PERFECT DETAILS.

THERE is not a single feature of these dividers which has not been carefully studied with the object of making it perfect, and we believe that there is no room now left for improvement either in proportions, fit, finish or weight.

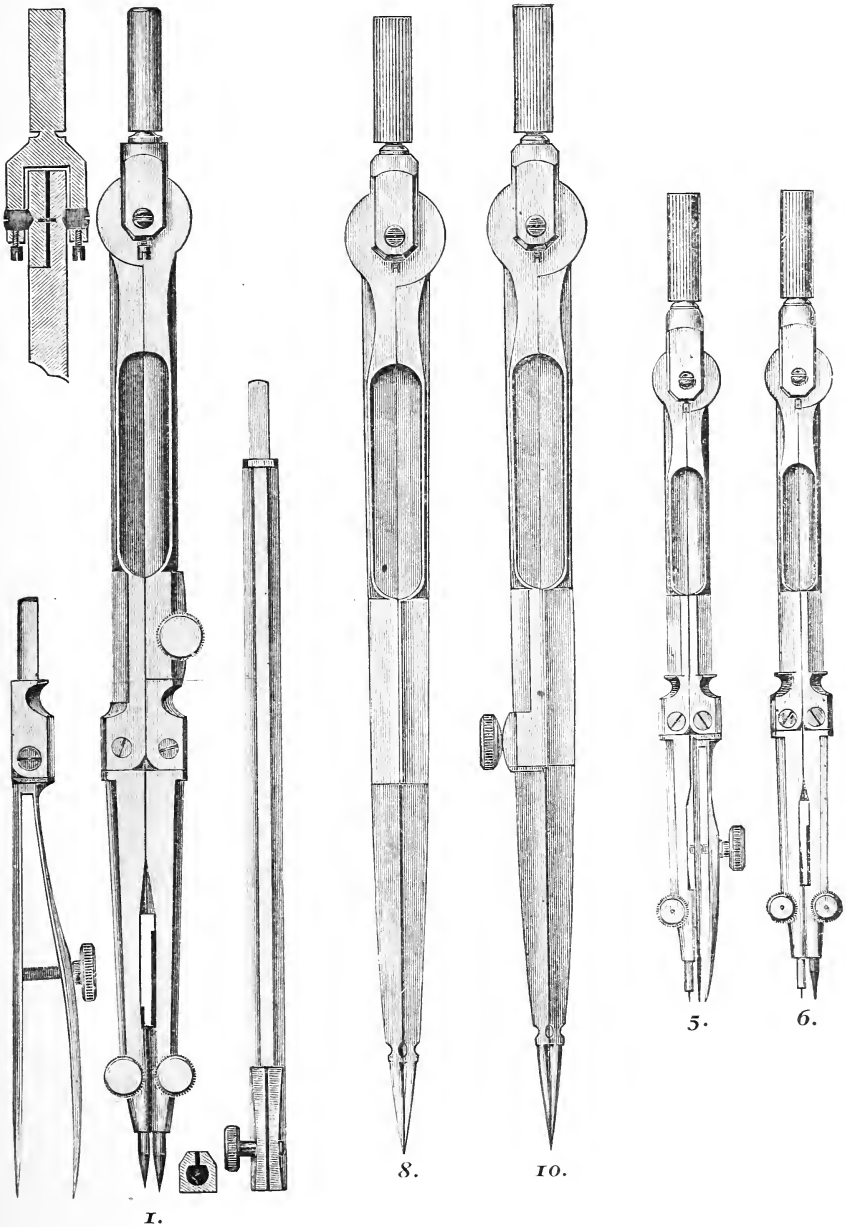
Kinds, Sizes and Capacities.

WE make these dividers of three kinds to suit individual requirements or convenience. When the use is not constant and the trouble and delay of changing from pencil to pen is not an important item, we furnish the divider in which one of the legs has a clamp socket to receive either (see cut No. 1, page 9), but for a professional draughtsman, who is using his instruments continuously, we recommend two separate ones of the kind in which the pencil and pen are permanently hinged to the legs (see cuts 5 and 6, page 9). This avoids all delay, is more convenient in every respect, and tends to preserve the tools in better condition.

Two sizes of either of these kinds can be furnished, one 5½ inches long, and one 3½ inches long, the former of which can be used for circles up to 5½ inches radius, with the needle-point and pencil or pen kept perpendicular to the paper, or up to 9½ inches radius with the addition of the lengthening bar. The latter size can be used for circles up to 3½ inches radius, with the points kept perpendicular to the paper. A busy draughtsman will find it economy in time, thought and care, to keep two separate instruments of each of these sizes, while the man who spends only a part of his time in drawing, will find the functions of both kinds combined in the instrument with interchangeable pencil and pen.

Those of our old customers who are mechanical engineers and noted engineering draughtsmen, almost invariably use a pair of the 3½-inch, one pencil and one pen, and consider them the most useful tools they possess, while they use a single 5½-inch, with interchangeable pen and pencil, on account of the smaller amount of work requiring this size.

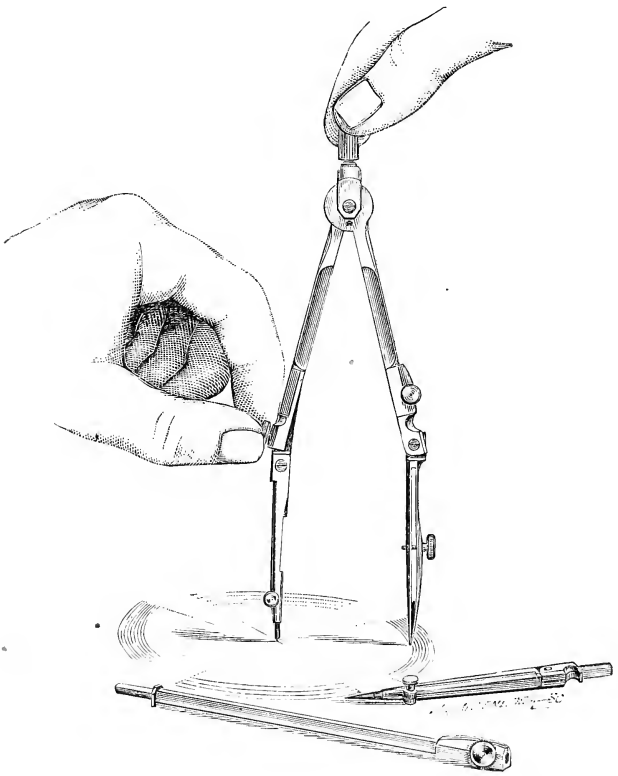
Alteneder's Patent Joint Dividers.



The above instruments are made either 5½ or 3½ inches long.

Patent Joint Dividers,

WITH HAIR-SPRING ATTACHMENT ON NEEDLE-POINT LEG.



THESE instruments are the same in size, and possess all the features of the dividers already described, with the addition of a screw-adjustment of the needle-point leg, a refinement which aids materially in accurate work, is useful in ordinary work and which does not detract in the least from the stiffness and reliability of the tool.

CONSTRUCTION.

THIS adjustment is obtained by jointing the lower half of the needle-point leg to an intermediate, long, stiff, steel spring, which is accurately fitted in a groove in the upper half, but is attached only at its upper end, the lower end being drawn into place against the elasticity of the spring by means of a thumb-screw.

This gives to the needle-point a very delicate, though rigid, adjustment, which can be used for two purposes, either for correcting any slight inaccuracies in setting the pencil or pen, or for drawing parallel circles at minute distances apart.

By its use, the pencil or pen can be set with the utmost nicety without removing the needle-point from the paper, thus overcoming the difficulty often experienced in drawing arcs perfectly tangent to each other or to straight lines, as well as arcs of precise radius or passing through an exact point.

OPERATION.

THE operation is as follows: Adjust the thumb-screw until the spring is in a position somewhere near the middle of its movement, in order to allow for final adjustment in either direction. Put the needle-point into the paper at the given centre, open or close the legs *approximately* to the point through which the circle is to pass, and then, with the fingers of the other hand and without removing the needle-point from the paper, turn the thumb-screw to the right or left in order to bring the pencil or pen precisely to the point required. The delicacy and accuracy thus attained, without sacrifice of rigidity in the tool or convenience in the handling of it, are valuable additions.

ADVANTAGES.

IN mechanical drawings of any intricacy, it frequently happens that there are many circles having the same centre, and that the centre hole in the paper becomes so enlarged as to be totally

unreliable, besides detracting from the appearance of the drawing. This arises from the side strain of the needle-point in the centre hole, due to the force exerted in opening and closing the legs to make so many fine adjustments. With the screw adjustment, handled with proper care and judgment, the centre hole can be kept in perfect condition, no matter how many concentric circles are drawn about it, and, at the same time, the operation is more convenient and accurate.

Another important advantage of this attachment is that it renders the instrument superior to anything else for use as STEPPING or SPACING DIVIDERS for 3-inch spaces or over. For this purpose the lead is replaced by the extra needle-point, the knuckle-joints permit both needles to be set perpendicular to the paper, and the screw adjustment enables their distance apart to be regulated with exactness. In spacing teeth around a pitch circle, or in dividing a given length into a given number of equal parts, the convenience and accuracy of the adjustment, and the great advantage of having the needle-points perpendicular, will be immediately apparent.

Plain Dividers,

WITH PATENT JOINT.

(*See Illustration No. 8, page 9.*)

THESE are made with the same balanced friction joint as the complete dividers already described, and possess the same quality of metal and workmanship. The steel points are carefully tempered and finely ground to a conical shape in order to avoid the reaming effect of the triangular shape usually given them. They are made in two sizes, 3½ inches long, and 5 inches long.

Hair-Spring Dividers.

WITH PATENT JOINT.

(*See Illustration No. 10, page 9.*)

ONE of the principal uses of plain dividers is the stepping-off of a series of equal spaces, such as in laying out gear teeth, spacing rivets and boiler tubes, and in all work in which there is a duplication of parts at equal distances. It is a matter of great difficulty, even for experts, to set the ordinary plain dividers for this purpose. The trouble is that it is impossible to judge of the exact amount of alteration given them when the first trial has proved the space incorrect and they have been shifted and tried the second time, so that it becomes a question of pure chance when the right space will be struck.

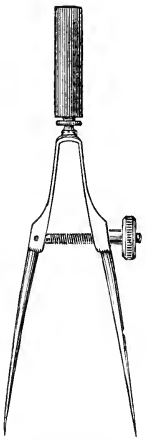
By the addition of the hair-spring adjustment, this trouble is entirely overcome, because the user soon becomes familiar with the amount of movement imparted to the point by a certain portion of a turn of the thumb-screw, and, knowing the amount of error after the first trial, he can quickly correct it in a definite way without guess-work.

The construction of the attachment is the same as that already described for the regular dividers. It does not in the least impair the stiffness and reliability of the instrument. Two sizes are made, 3½ inches and 5 inches long.

Spring Bow Instruments.

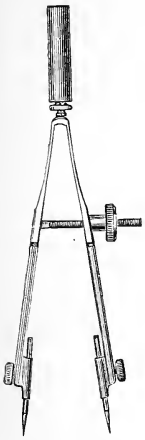
THESE instruments are used as adjuncts to the regular dividers and have their own special field of usefulness. The two legs are made of one continuous piece of steel, finished and tempered with the greatest care, and are warranted to retain their qualities indefinitely. The handle is of German silver screwed into the instrument. The superior quality and temper of the steel enables the points to be separated to an unusual extent without losing stiffness. The threads of the adjusting-screws will not strip or tear out.

SPRING BOW SPACER.



Spring Bow Spacer.

THIS has plain, round legs, ground to long, fine points. The points are drawn together by means of a thumb-nut on a fine, steel screw, acting in opposition to the spring of the legs, so that there can be no lost motion and no accidental change in the position of the points. In this respect they are very superior to plain dividers, which are liable to be altered by a "jar" after being set. The convenience of being able to set this spacer with the utmost nicety and ease, and to lay it down and take it up any number of times with the certainty of its retaining its exact adjustment, should commend its use to every practical man·

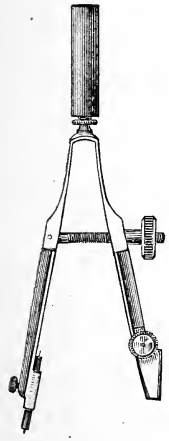


Needle-Point Spacer.

SPRING BOW SPACER WITH NEEDLE-POINTS.

IN this instrument, each leg is furnished with an adjustable, removable needle-point, to enable the equality of the points to be always maintained. It is preferable to the plain spacer, and particularly so for work on metals, such as sheet brass, because the points can be tempered to suit, re-ground, adjusted to coincide in length, and replaced at trifling cost when used up.

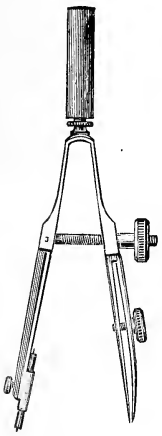
SPRING BOW PENCIL.



Spring Bow Pencil.

IN this instrument, one leg is provided with an adjustable needle-point and the other with a clamping socket to hold the round lead. Apart from its delicate adjustment for making the small circles on a drawing, it is very convenient for making all the duplicate circles, such as those which represent bolt holes, rivets, boiler tubes, etc., because it can be relied upon to maintain the size without any care on the part of the user. For drawing all the small fillets and corners to be shown on a drawing, it is far superior to the joint dividers. It is not intended to take the place of the latter, but to be used as an aid to it.

SPRING BOW PEN.



Spring Bow Pen.

THIS has an adjustable needle-point on one leg and either a plain or a spring pen on the other, the pen being of one piece with the leg. For inking all the very small circles, fillets, corners, etc., on a drawing, this instrument is almost indispensable, and for all duplicate circles within its range, it is a great convenience. The adjustment is much quicker than might be supposed, as the legs can be pressed together to approximate the required distance by the fingers of the left hand, and the thumb-nut rapidly run up in contact by the right hand, the final close adjustment being made by the thumb-nut alone.

THE spring bow instruments are made 1½, 2, 3, 4 and 5 inches long. There seems to be an impression among some draughtsmen that the smaller instruments will more readily do smaller work. This is especially true of the bow pen. It is, however, a mistake, as the 3-inch size will, if properly constructed and sharpened, make as small a circle as the 1½ inch. It is, perhaps, advisable to keep a small bow pen, and use it only for the smallest circles, as it tends to keep it in condition; but we recommend the 3-inch always, as it answers all purposes, from the smallest up to the largest within its capacity. The 4 or 5-inch Bow Spacers are, however, very useful and far superior to any joint dividers with clamp and tangent-screw, as they can be more rapidly set, the adjustment is more delicate and they will retain their position fully as well.

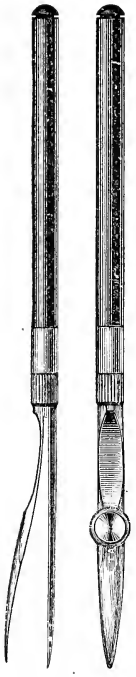
Ruling Pen.

Ruling Pen.

IT is very important to a draughtsman that this essential instrument be of the best form and quality that can be obtained, regardless of cost. The annoyance, delay and bad work, which a poor pen is capable of causing, can not be afforded by anyone who has much use for it, and consequently that pen in which every detail of shape, finish and material has received the closest attention, should be the one selected.

Thoroughly appreciating this, we spare no pains to produce as nearly perfect a pen as possible. It is made in one piece in order to avoid all joints, with their liability to wear and consequent lost motion. The steel is of the very best quality, tempered to a hardness which our long experience has shown to be best adapted to the purpose. The adjusting-screw is of steel, well-fitted to the threads in the blade. It is screwed into the milled head, and not merely riveted, as is the case with cheap pens. We guarantee that the thread will not strip and that the milled head will not come off. The point is very carefully and accurately ground to the best shape for making perfect lines, and the blades are finely finished both outside and inside. The handle is of ebony or ivory, as desired, and is so fitted to the German silver socket that it will not become loose. It is fitted with a pricker-point when desired. For use with red ink, we furnish a nickel-plated pen, but do not recommend it as a rule. The pen should always be wiped clean, except when in actual use, as most of the inks used in draughting contain an acid that eats into the steel, and will, in a short time, ruin the best ruling pen unless carefully wiped. Three sizes are made, 4½, 5 and 5½ inches long.

Improved Ruling Pen.

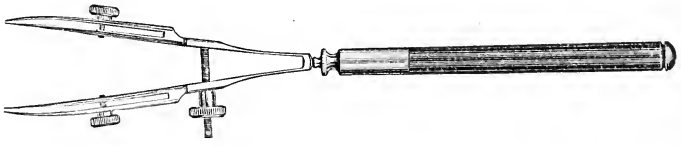


Improved Ruling Pen.

THE objection to a pen made of one piece of steel is that it is less handy to clean than a pen with the upper blade hinged, and the great disadvantage of the hinged pen is that the points will not match after the hinge wears, thus making it impossible to rule perfect lines.

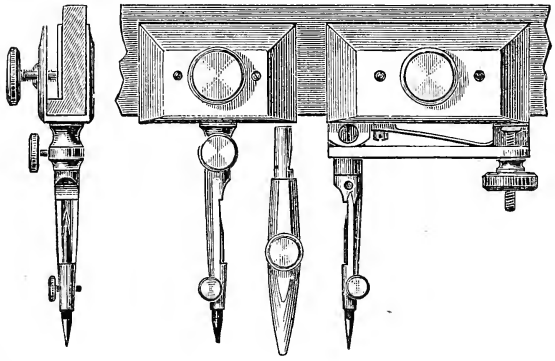
Our improved pen possesses the advantages of the hinge pen without its disadvantages. It is made of one piece of steel; the upper blade is in the form of a spring, causing it to open wide to facilitate cleaning, and also diminish the stiffness of the adjustment for the thickness of the line to be drawn. Although this will do no better work than our standard pen, still the additional convenience of it is well worth the slight additional cost. This improvement is applied to all sizes and styles.

Railroad Pen.



THIS consists of a spring bow with a pen on each leg and an adjusting-screw and thumb-nut for delicately adjusting the distance apart. It is intended especially for ruling railroad tracks or double lines.

Beam Compass.



IN all kinds of draughting, circles or arcs of larger radius than 8 or 10 inches are continually required, and it is important to possess an instrument that is light, handy, accurate and reliable for the work which may be beyond the capacity of the standard sizes of dividers. Such an instrument is found in the beam compass, which, as we construct it, is capable of almost as delicate adjustment and ready manipulation as the dividers.

It consists of two parts, one to hold the pencil or pen, and the other the needle-point. Each of these parts is a deep channel made of hammered German silver to secure elasticity, stiffness and lightness. Underneath one of the channels is a socket to receive and hold either the pencil-leg or pen. The pencil-leg has our standard clamp-holder for the round lead, to which is also fitted a needle-point for use in conjunction with the one on the other channel for stepping or scribing. The pen is made of one piece of steel, with a shank fitting interchangeably in the same socket as the pencil-leg, and is of the same quality as our standard pens.

The other channel has underneath it a bell-crank, hinged at one end. A fine steel screw is fastened in the other end of the channel and passes down through the horizontal arm of the bell-crank with a

thumb-nut on the outside. A stiff, flat spring is fastened under the channel and keeps the arm pressed against the thumb-nut. The vertical arm of the bell-crank has a socket into which is screwed a standard needle-point leg with adjustable and changeable needle-point to match the pencil-leg of the other channel.

Each of these channels is provided with a light metal shoe, adjustable by means of a thumb-screw and guided by two steel screws. The shoe does not reach to the bottom of the channel, but leaves space enough for a flange on the lower edge of the hard-wood bar which is fitted to the channel. (See section.) It will thus be seen that the shoe, with its lower edge resting upon the flange permits the channel to be freely slid along the bar, while a turn of the thumb-screw will firmly clamp it in any desired position.

The final, accurate adjustment of the distance is obtained by means of the bell-crank which holds the needle-point leg. The thumb-nut, acting on the extreme end of the horizontal arm, produces an equal effect at the needle-point, while the spring always presses the arm firmly against the nut and prevents the possibility of any lost motion.

The method of handling the instrument is to place the needle point in the centre of the desired circle, slide the pencil-channel to within an eighth of an inch of the radius, and then adjust to the exact distance by means of the thumb-nut. As fine and accurate work can be accomplished with this instrument as with dividers.

The use of a wooden bar has many advantages. It is lighter, stiffer, cheaper and more readily extemporized than any metal construction. Several bars of different lengths can be kept conveniently at hand, and in case of a very large radius being required, for which the draughtsman has no bar, it is an easy matter to make a temporary one without a flange, because the flange, though convenient, is not essential.

When desired, we furnish a graduated bar by which distances in inches and twentieths, and inches and thirty-seconds, can be conveniently and quickly set off.

Two sizes of these beam compasses are made, but for general draughting purposes the small size is the handiest.

Instruments in Cases.

PERHAPS the best way for a draughtsman to perfect his outfit is for him to purchase the instruments singly, according as his requirements or his desires suggest, and, after waiting a sufficient time to determine that his needs are completely filled, to have a case made to order to properly hold them and to suit his methods of work.

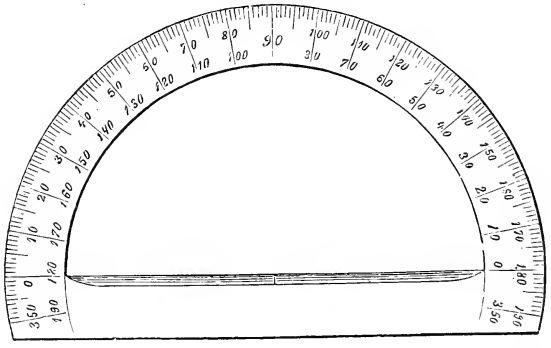
We furnish finely-finished cases of any size, form and arrangement that may be desired, besides which we keep in stock various standard sets of instruments in cases, a list of which, with prices, is given in our Catalogue.

Protractors.

THE requirements of a protractor are that it shall be light and handy, and, at the same time, so stiff and strong that it will retain its shape; and, above all, that its graduations shall be *fine, distinct and accurate.*

Our protractors are made of *Hard Rolled German Silver*, which is greatly superior to ordinary castings in strength, hardness and elasticity. They are graduated on our own engine; and of their accuracy we are entirely convinced. We guarantee them to be superior to any others.

PLAIN PROTRACTOR.

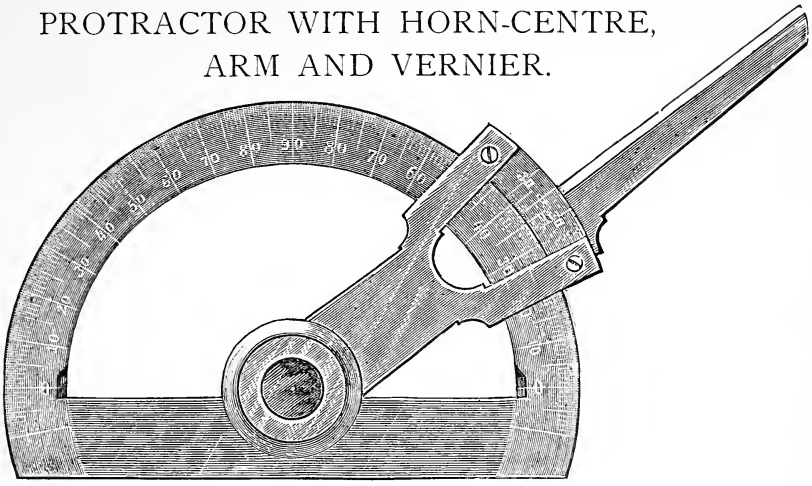


THESE are made either half circle or whole circle, the former 5, 6, 7, 8 and 10 inches diameter and the latter 6, 8 and 10 inches. The centre is on the inside edge of the cross-bar. The smaller sizes are graduated to half degrees and the larger to quarter degrees.

PROTRACTOR WITH ARM AND HORN-CENTRE.

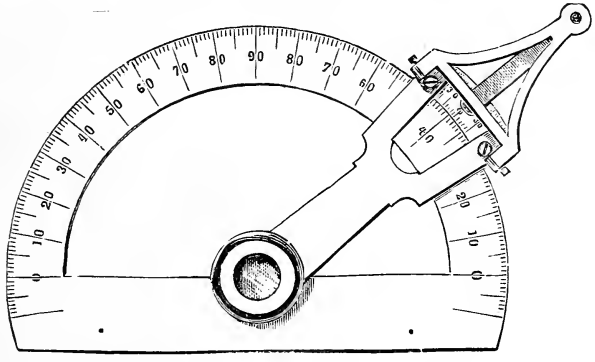
THIS is provided with an arm accurately fitted to swing exactly around the centre, the beveled edge of the arm being an exact radius. It has a horn-centre with "peep-hole" to enable it to be set to a precise point. The arm adds materially to the range, usefulness and convenience of the instrument. We make them 5, 6, 7 and 8 inches diameter, either half circle or whole circle.

PROTRACTOR WITH HORN-CENTRE, ARM AND VERNIER.



IN this instrument the arm carries a vernier in order to permit close reading. We make them 5, 6, 7, 8 and 10 inches diameter half circle, and 5, 6, 8 and 10 inches, whole circle, the 5 and 6 reading to 3 minutes and the rest to 1 minute.

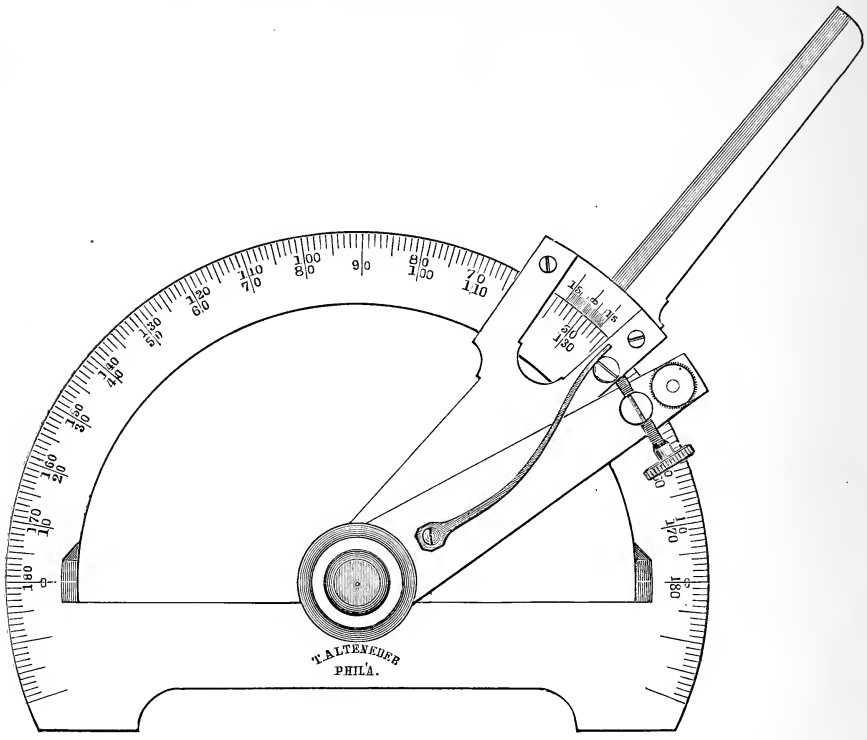
PROTRACTOR WITH HORN-CENTRE, VERNIER AND ARM DOTTER.



THE arm of this instrument has no radial edge but is provided with a pricker-point, which is exactly on the radial line which passes through the zero of the vernier. This arrangement is preferred for some purposes.

It is made 6 inches in diameter, half circle, reading to 3 minutes, and 8 inches diameter, half circle, reading to 1 minute.

PROTRACTOR WITH HORN-CENTRE, ARM, VERNIER AND MICROMETER ADJUSTMENT.



THIS is the most convenient, accurate and reliable instrument of the kind that is made. It has a clamping-arm held rigidly at any part of the circle by means of a shoe and thumb-nut. A spring on this clamping-arm holds the vernier-arm against the end of an adjusting-screw, working in a split-nut also on the clamping-arm. The nut has a clamping-screw to take up any wear and lost motion.

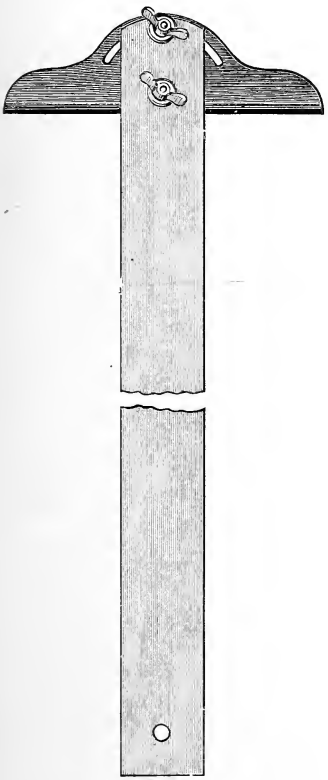
By this arrangement, the arm can be swung freely when the thumb-nut is released and held firmly when it is tightened, while the most delicate adjustment of the vernier-arm can be made with a certainty of its retaining its position.

This instrument is made of 6, 8 and 10 inches diameter, both half and whole circle, graduated to ¼ degrees and reading to 1 minute.

T-Squares.

OUR *T*-SQUARES are made of hard, close-grained, well-seasoned wood. They are flat, and the edges are perfectly straight and they will retain these qualities. The heads are square with the blades, although this is unimportant, because the accuracy of the work depends upon the edges of the drawing board and triangles being square, and not upon the *T*-square. We make the usual styles, all of which are superior in material and workmanship.

SWIVEL *T*-SQUARE.



Swivel *T*-Square.

THIS is an instrument, the convenience and utility of which are not fully appreciated. Its use has not been, by any means, general, although it should form an essential part of every draughtsman's outfit.

When it is considered that the original penciling of a drawing often occupies days and even weeks, and that the atmospheric changes during that time are apt to slightly alter the form of the board and the position of the paper, it can be understood that a *T*-square which can be always set to coincide with a base-line originally drawn, will add materially to the parallelism and accuracy of the work and will avoid the great annoyance arising from any variation between a rigid *T*-square and lines already drawn. For making tracings it is a great convenience in doing away with the care needed in setting the work to coincide with a fixed

T-square. Also when the base of one portion of a drawing is at an angle with that of another portion, as is often the case, the use of a swivel *T*-square removes all difficulty.

The unsatisfactory behavior of most swivel *T*-squares is probably responsible for their unpopularity, because they have generally been made with a single clamping-swivel, which is not capable of holding the blade to the head with sufficient firmness to prevent a slight blow on the end of the blade from shifting it and ruining the adjustment. A slight amount of work done with a *T*-Square which had, unknown to the user, become shifted, would be sufficient to condemn its use forever in his mind.

We overcome this fault by using two clamping-screws, one at the pivot in the usual way and an additional one near the short end of the blade, which works in a circular slot in the head, concentric with the pivot. This enables the head and blade to be clamped together in a reliable manner, avoiding the possibility of accidental shifting.

The head is of polished mahogany and the blade of maple, or mahogany, ebony-lined, 42, 48, 54, 60, 66 or 72 inches long.

Triangles.

Hard Rubber Triangle.

A TRIANGLE should be light, easily handled and of a material which is strong and which will positively retain its shape. For these reasons our triangles are made of hard rubber with open centre, all the inside corners having large fillets to strengthen them, and to avoid the tendency which a crack has of starting in a sharp corner. They are well finished and are guaranteed to have straight edges and accurate angles.

We make two styles, one with 30°, 60° and 90° angles from 3 to 16 inches perpendicular length, and one with 45° and 90° angles from 3 to 15 inches perpendicular length.

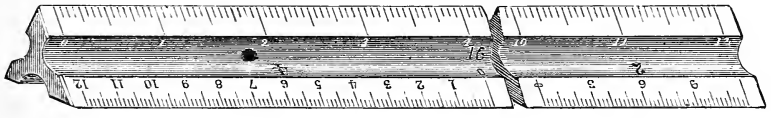
Draughting Scales.

WE have superior facilities for making scales of well-seasoned boxwood of any desired form and with any required graduations. The graduations are sharp and accurate and all the markings are distinct and permanent. Our scales are superior to most, and equal to any others made.

There is perhaps no other instrument used by draughtsmen, in which the requirements are so varied or individual preferences so different as in scales. The fact that they are used by mechanical engineers, civil engineers, topographical engineers, architects, surveyors, etc., and that each profession has its own units of measurement and each individual his own characteristic methods, is sufficient to indicate the immense variety that is demanded.

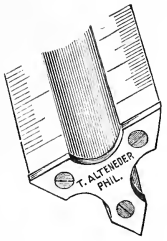
There are four standard shapes in general use, each possessing its own advantages, and the choice between them depends principally upon the requirements and tastes of the user.

TRIANGULAR.



THE triangular scale has the merit of possessing six surfaces for the graduations, so that six or (by doubling) twelve different scales can be marked upon it. This is an advantage for any one who desires the greatest range with one piece, but is objected to by many and particularly the most active draughtsmen on account of its obstinate tendency to present the wrong scale, and the annoying trouble of turning it over and over to obtain the right one.

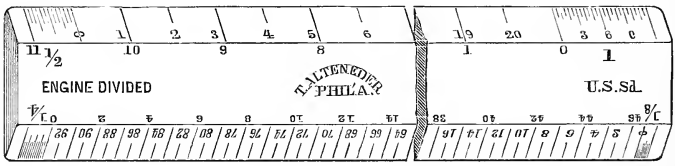
SCALE PROTECTOR.



Scale Protectors.

THE scale protector, for triangular scales, consists of a German silver cap screwed upon each end of the scale. It is of the same shape as the end, but just sufficiently large to prevent the graduations from coming in contact with the paper. It keeps the scale clean and prevents wear. We have manufactured these protectors since 1874, and believe the device to have been original with us at that time.

FLAT SCALE.



THE plain, flat scale is probably more used by experts than any other shape. It has but two surfaces for the graduations, and if these are different and the wrong one presented, it requires but one change to bring the right one. This change, however, has to be from end to end, an inconvenient operation.

FLAT SCALE WITH OPPOSITE BEVEL.

TO overcome this objection, we make a flat scale with opposite bevel, which can be very quickly turned over and readily picked up. It has also the advantage of presenting only one graduated surface to the eye when in use.

FLAT SCALE, BEVELED ON BOTH SIDES.

THE flat scale, beveled on both sides, is a compromise between the ordinary flat and the triangular. It has four surfaces for graduations, but requires to be held up in order to bring the edge down to the paper.

GRADUATIONS.

OUR scales are all engine-divided to accurate U. S. standard measurements. We carry in stock the shapes already mentioned graduated in the conventional way, that is, with two scales (one double the other) on each surface, the end unit only of each being subdivided.

It is strange that the greatest general demand is for scales graduated in this manner, although they are far less convenient than those with only one scale on each surface and that subdivided the entire length.

Experts, as a rule, have their scales made to order to suit their methods of work, but almost invariably use the latter plan of graduation, the additional expense of which is trifling in comparison with its advantages. In ordering special scales, it is advisable to furnish sketch showing graduations and figuring. We are prepared to make accurate graduations of any "parts to the inch or foot." Those in general use are: 10, 20, 30, 40, 50, 60, 80 and 100 parts to the inch; 100, 200, 300, 400, 500, 600, 800 and 1000 parts to the foot; $\frac{3}{32}$, $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, 1½, 2, 3, 4, 6 and 12 inches to the foot, and full-size and half-size.

Metric scales, divided to millimetres. Our standard lengths are 6, 12, 18 and 24 inches for the U. S. measures, and 10, 20, 30 and 50 centimetres for the metric system.

IVORY SCALES.

WE make flat scales of fine white bleached ivory 6 and 12 inches, or 10, 20 and 30 centimetres long, divided in the same manner as the boxwood.

THUMB-TACKS.

Thumb-Tacks.

OUR thumb-tacks have German silver beveled heads with steel pins screwed into the head, which are warranted not to come out. The tacks are superior in construction and finish.

A CATALOGUE and price-list of all the instruments made by us will be mailed to any one interested in the subject, who may request us to do so. This Catalogue also contains copies of a few of the many letters which we have received commending our tools. Many of the most eminent engineers and architects have used these instruments for twenty or thirty years and prefer their old instruments now to any new ones of other make. We have yet to hear of the first instance where our instruments did not give satisfaction, or where they could not be made as good as new after thirty years' use in expert hands. It is unnecessary to call the attention of professional men to the value of these features, because they realize and appreciate the importance of using instruments which are always the same in behavior and feel; but, to the apprentice, the student or young engineer just beginning his career, we would like to give a warning against the purchase of cheap instruments, highly polished and attractively arranged in handsome cases, which will not retain their qualities many months and will prove a source of vexation, delay and bad work until they are finally cast aside. It is far better to invest the cost of such a case in two or three essential tools of the very best make obtainable, and then gradually to add to these as requirements suggest and ability increases, until a first-class outfit is obtained, which will last a lifetime, and which will become so familiar as to require no thought or care in handling. Such a course of procedure will actually prove a considerable saving in money, although the price paid for each article may have been two or three times as much in the latter instance as in the former.

Opinions on Genuine Alteneder Instruments.

LEWIS M. HAUPT, *Prof. of Civil Engineering,*
University of Pennsylvania.

THEODORE ALTENEDER,

DEAR SIR:—It gives me pleasure to bear witness to the uniform excellence and accuracy of your Draughting Instruments. As it is impossible to do good work without good instruments, it is important even for beginners to equip themselves properly at the outset. Your instruments work as smoothly and are as durable as any I have ever handled.

WM. H. THORNE, *Director of Mechanical Drawing,*
Franklin Institute of Pennsylvania.

THEODORE ALTENEDER,

DEAR SIR:—The six inch protractor, arm and vernier is received. I am well pleased with it. As I have still in use a full set of your Drawing Instruments, most of which I bought from you more than twenty years ago, I can testify to their reliability and superiority, and I feel no hesitation in saying that I prefer to use these old tools to new ones of any other make.

L. J. BOECK, *Late Prof. of Civil and Mechanical Engineering,*
University of Virginia.

THEODORE ALTENEDER,

DEAR SIR:—I have been using for the last thirty years without interruption almost exclusively the drawing instruments manufactured by you, and I can conscientiously attest that I found them far superior to any similar instruments manufactured either in this country or abroad. The numerous improvements made by you with respect to joints of dividers, spring drawing pens, etc., are based upon sound technical principles and are conducive to an easy and exact working. I recommended invariably your instruments to my numerous students, who expressed an equal satisfaction with their use.

F. H. NOYES, *Instructor in Drawing,*
Cornell University.

THEODORE ALTENEDER,

DEAR SIR:—I have used your instruments, and pronounce them superior to any others I have ever used.

ROBERT FLETCHER, Ph. D., *Prof. of Civil Engineering,*
Thayer School of Civil Engineering.

THEODORE ALTENEDER,

DEAR SIR:—I wish to express my great satisfaction with the most excellent finish, fine appearance and very smooth action of this elegant draughting apparatus, which possesses all the merit and special excellencies that you claim. I only regret that I have subjected myself to considerable vexation and loss of time by working for some time past with inferior instruments.

JAMES H. WINDRIM, *Supervising Architect,*
Treasury Department, Washington.

I reply with pleasure to your favor in regard to my experience with your instruments. The first set I purchased from you—probably twenty years ago—are still in daily use. The instruments having your special joint are easy to adjust in the hand, which enables quick and very accurate work to be done with them. I consider them much the superior of any instrument I have seen.

DAVID EVANS, *Civil Engineer and Architect,*
Philadelphia.

With positive pleasure I testify to the superior merits of your drawing instruments. After a professional career of over a quarter century, during which time I have mainly used your instruments, I have had abundant opportunity of comparison with those of other makers, foreign and domestic, and continue to give you preference.

W. R. ECKERT, *Mechanical Engineer,*
San Francisco, Cal.

THEODORE ALTENEDER,

DEAR SIR:—I sent you by express yesterday some drawing instruments that I desire you to put in the best possible order. I request this to be done for I have quite an effection for these old instruments. They have been in my possession for 32 years, having bought them of you in 1856. They have been nearly in constant use, and I consider them better to-day than any new instrument that can be purchased from any other maker in Europe or the United States, and I would not now send them to be overhauled but I intend to turn them over to one of my sons, for him to see if after 32 years more they will not be still as good as ever, for when that time has elapsed the original maker could not repair them or the first owner use them.

JOHN MCARTHUR, JR., *Architect,*
New City Hall, Philadelphia.

THEODORE ALTENEDER,

DEAR SIR:—Having used your instruments for a number of years it affords me much pleasure to testify to their excellence. I know of none better.

WILLIAM H. BROWN, *Bush Hill Iron Works,*
Philadelphia.

THEODORE ALTENEDER,

DEAR SIR:—As a matter that must interest you it gives me pleasure to state that the case of drawing instruments that I purchased from you in 1855 after having been in almost daily use since that time are with the exception of the unavoidable wear of the pens, as good as on the day I purchased them. My experience with instruments of your make leads me to believe them unequalled.

James River Improvement Co., Engineers' Office.

THEODORE ALTENEDER, RICHMOND, VA., April 30th, 1889.

DEAR SIR:—The box of instruments has been received and has given satisfaction. I consider them the best class of instrument that is manufactured for such purposes.

C. P. E. BURGWYN,
Civil Engineer.

Bethlehem Iron Co.

THEODORE ALTENEDER, BETHLEHEM, PA., June 17th, 1889.

DEAR SIR:—The Bow Pencil reached me safely and proves perfectly satisfactory. I have always been an advocate of your instruments, my instruments (all of your make) are as good as new, although they have been in constant use for many years.

ELLIS C. KENT.

Cornell University.

THEODORE ALTENEDER, ITHACA, N. Y., April 20th, 1889.

DEAR SIR:—The instruments came all right. In my experience with genuine Alteneder Instruments I have found them superior to any others that I have used, their lightness and accuracy recommend them to all in search of the best.

E. H. HULBERT.

Pickles & Sutton, Architects and Superintendents.

THEODORE ALTENEDER, TACOMA, W. T., April 20th, 1889.

DEAR SIR:—I am very much pleased with the instruments, and consider them without an equal. I can say also that there is a wonderful difference between your tools and those sold by some dealers, as pivot joint instruments, which are of course got up in imitation of yours, without the careful and accurate workmanship, finish and adjustment. The ruling pens are simply perfect.

JAMES PICKLES.

Cape Girardeau and Southwestern Railway.

THEODORE ALTENDER, CAPE GIRARDEAU, MO., May 24th, 1889.

DEAR SIR:—The drawing instruments you sent me are in every respect satisfactory. They are well adapted to precision in drawing, with your improved protractor accuracy is obtainable in laying down angles.

JAMES F. BROOKS,
Chief Engineer.

Bucyrus Foundry and Manufacturing Co.

THEODORE ALTENEDER, BUCYRUS, OHIO, December 27th, 1888.

DEAR SIR:—I have decided to keep the whole of the instruments —they are perfect "Gems." The result of my writing directly to you was the attempts of more than one dealer to pass off your patent joint, made by very inferior imitators. Henceforth I hope you will put me on your list of customers, being satisfied as to the superiority of your work.

ROBT. A. CUMMINGS.

THEODORE ALTENEDER, SPOKANEE FALLS, W. T.

DEAR SIR:—The instruments received in good condition. I highly recommend them for accuracy in fine draughting.

H. M. RITNER.

Allegheny College.

THEODORE ALTENEDER, MEADVILLE, PA., February 11th, 1889.

DEAR SIR:—The instruments are entirely satisfactory, the ruling pens are the best it has ever been my fortune to use.

WILLIAM S. TWINING, C. E.,
Instructor in Civil Engineering.

Sheffield Scientific School of Yale College.

THEODORE ALTENEDER, NEW HAVEN, CONN., October 20th, 1888.

DEAR SIR:—My opinion of your instruments, based on personal use, is that they are unequalled by any other make with which I am acquainted.

S. E. BARNEY, JR.

Colorado Midland Railway Co.

THEODORE ALTENEDER, COLORADO SPRINGS, COL., December 23rd, 1888.

DEAR SIR:—Acknowledge the receipt of draughting tools O. K., and find them, as I always have from your house, the best made.

W. B. BURTIS.

Coshocton and Southern Railroad Co.

THEODORE ALTENEDER, COSHOCTON, OHIO, April 9th.

DEAR SIR:—Please send me your latest catalogue. I have been using your instruments over ten years and consider them the best.

C. O. PALMER.

ESTABLISHED 1850.

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Theodore Alteneder, Jr.
Ferd. A. Alteneder.

TRADE T.A. MARK

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MANUFACTURER OF THE

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Boxwood Scales, Fine Protractors, Etc., for Architects, Engineers and Draughtsmen.

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Warranted **SUPERIOR IN** { *WORKMANSHIP*
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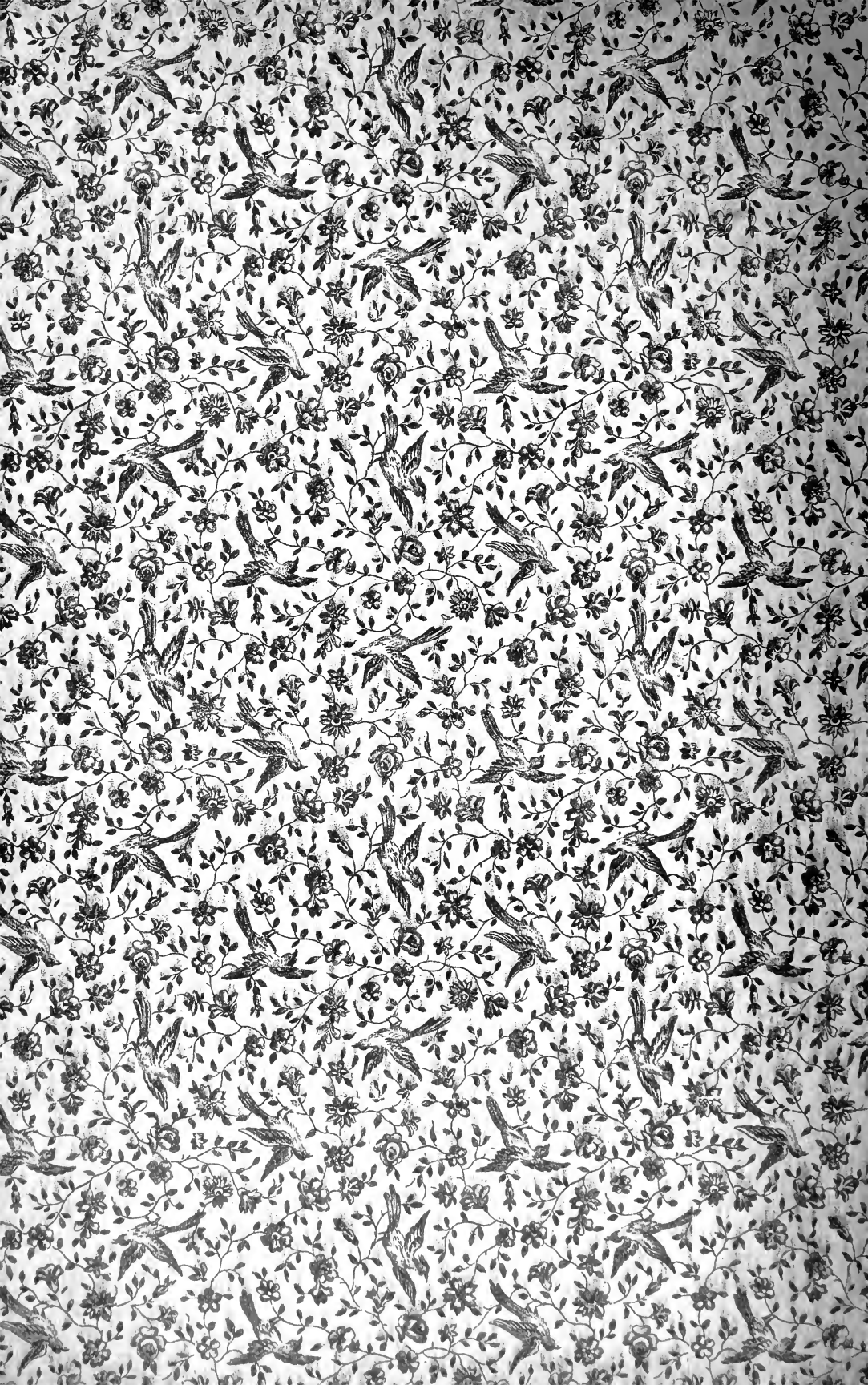

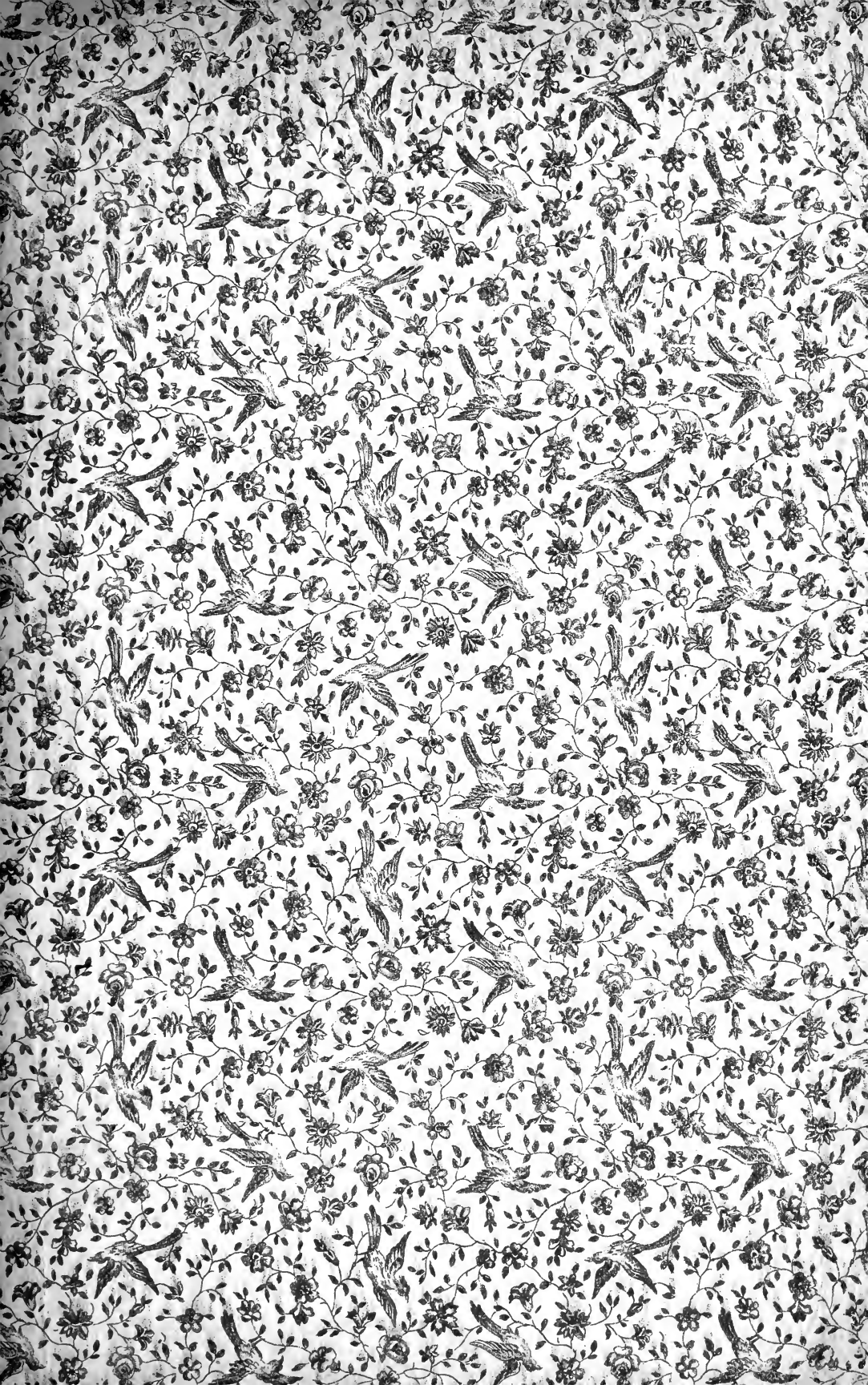

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